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(54) **USER INTERFACE PUSH CHANNEL**

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H04L 29/08 (2006.01)

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(58) **Field of Classification Search**
CPC G06F 3/048; H04L 29/06
See application file for complete search history.

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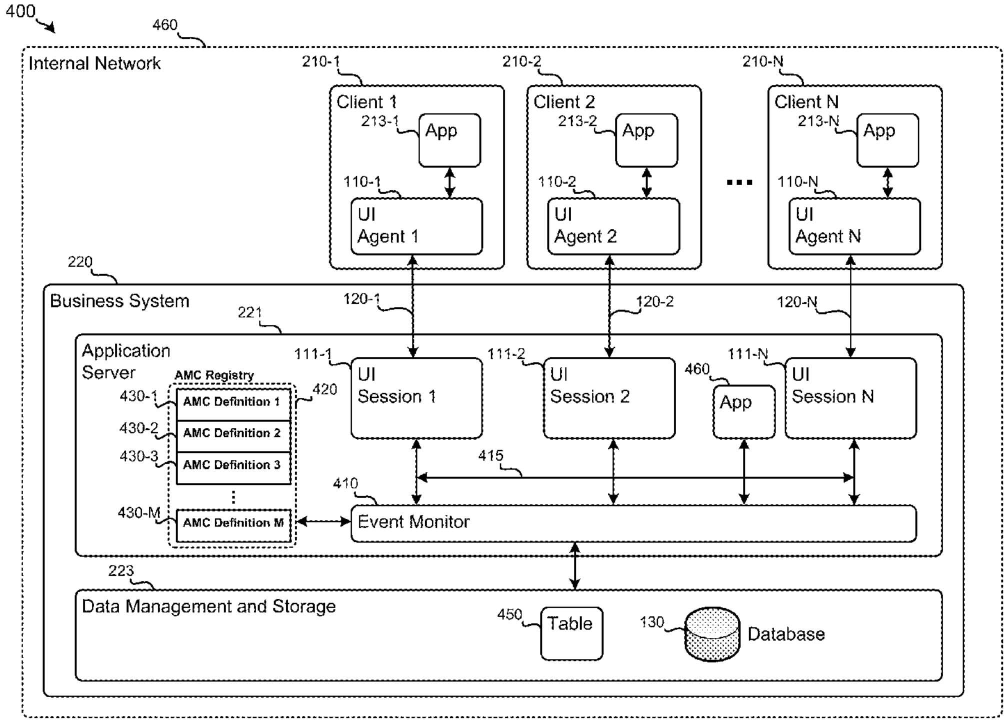
(57) **ABSTRACT**

Systems and methods for establishing UI push channels are disclosed. The UI push channels can be used to broadcast event notifications to multiple UIs whenever the information in an underlying data source is changed. In response to the event notifications, the UIs may update or refresh the displayed information so as to include the most current information in the data source. UI push channels are defined by associations between an application messaging channel (AMC) and the UI connection used to communicate with the client computing device and the application server. In particular, the UI push channels can be established by an AMC definition that defines a target data source, subscriber entities, and publisher entities. The listing of the publishers and the subscribers in the AMC definition infer the associations between the corresponding AMC and the UI connections.

17 Claims, 9 Drawing Sheets



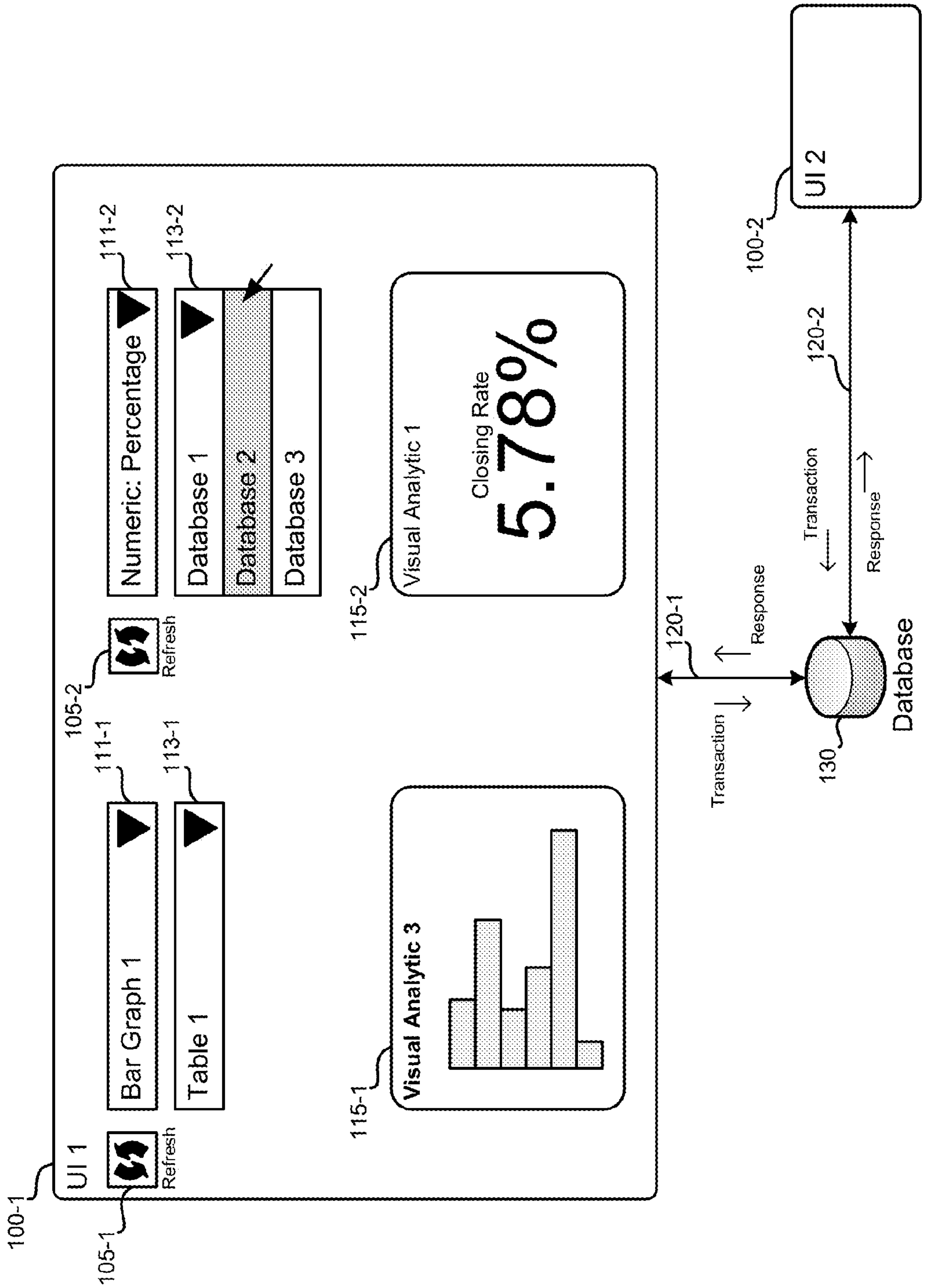

100-1
UI 1
105-1
Refresh
111-1
Bar Graph 1
113-1
Table 1
105-2
Refresh
111-2
Numeric: Percentage
113-2
Database 1
Database 2
Database 3
115-1
Visual Analytic 3
115-2
Visual Analytic 1
Closing Rate
5.78%
120-1
Transaction
Response
130
Database
Transaction
Response
120-2
100-2
UI 2

Fig. 1

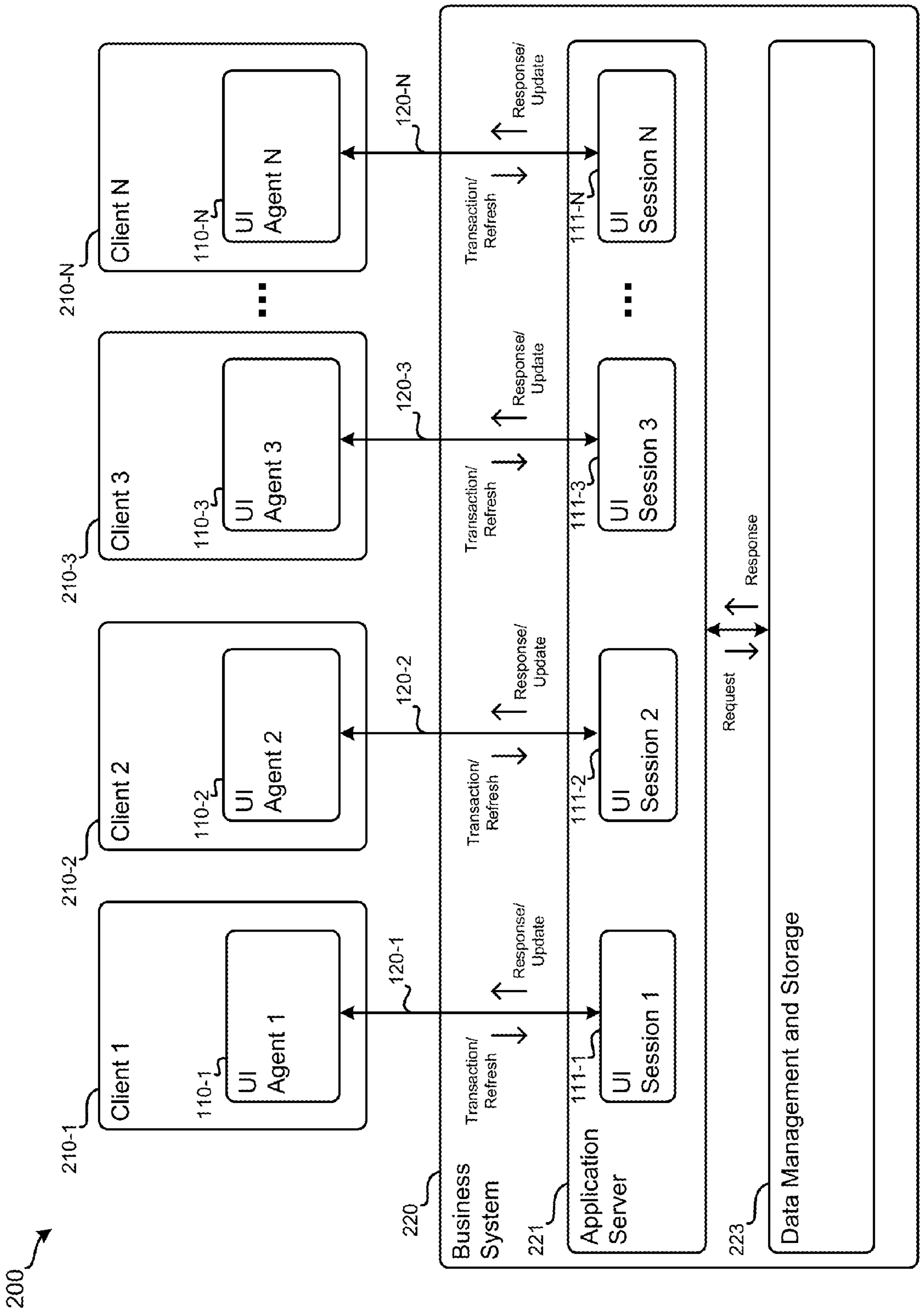

200
210-1
Client 1
110-1
UI
Agent 1
210-2
Client 2
110-2
UI
Agent 2
210-3
Client 3
110-3
UI
Agent 3
210-N
Client N
110-N
UI
Agent N
120-1
120-2
120-3
120-N
Transaction/
Refresh
Response/
Update
220
Business
System
221
Application
Server
111-1
UI
Session 1
111-2
UI
Session 2
111-3
UI
Session 3
111-N
UI
Session N
Request
Response
223
Data Management and Storage

Fig. 2

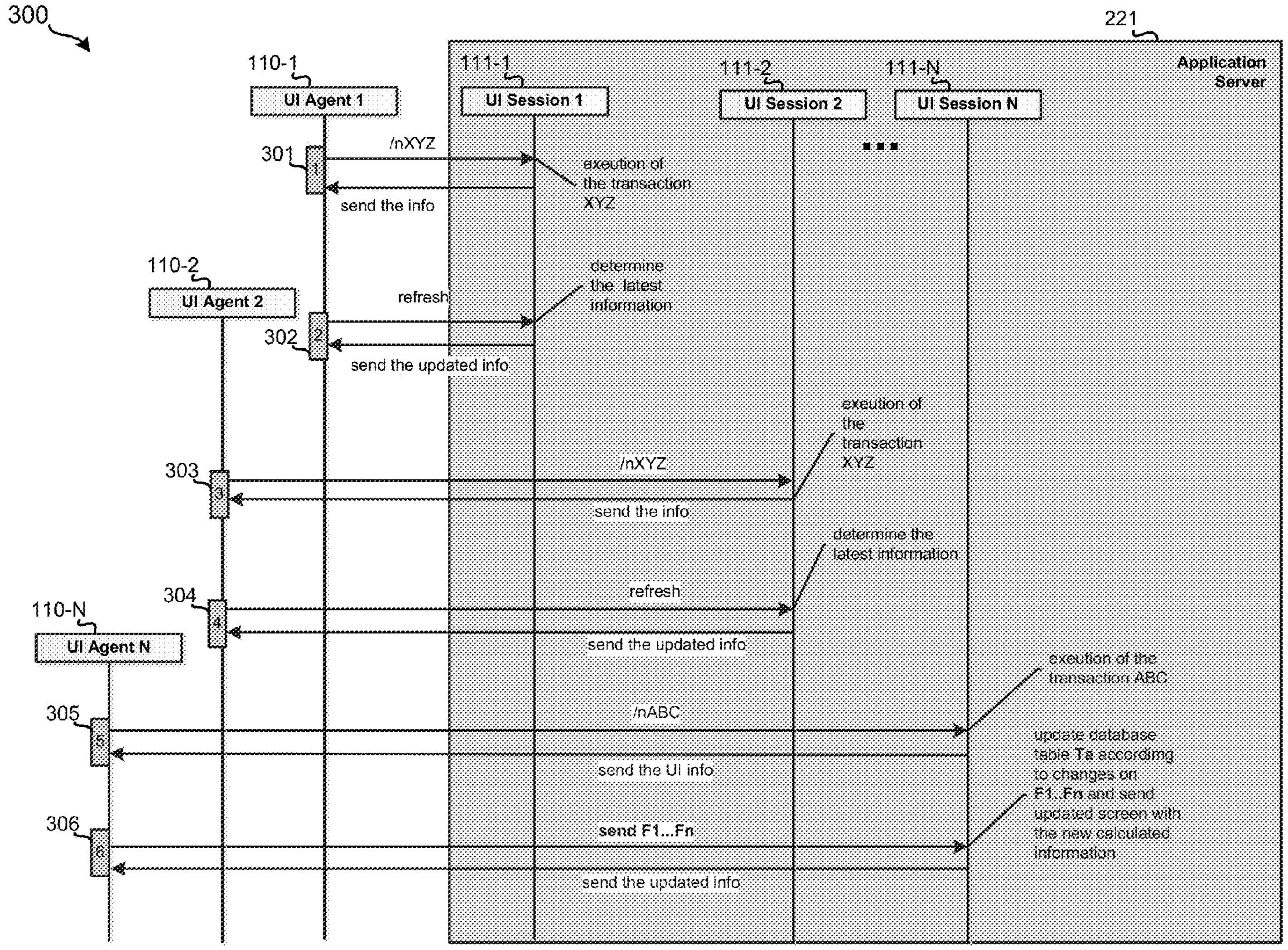

300
110-1
UI Agent 1
110-2
UI Agent 2
110-N
UI Agent N
221
Application Server
111-1
UI Session 1
111-2
UI Session 2
111-N
UI Session N
301
1
/nXYZ
send the info
exeution of the transaction XYZ
302
2
refresh
send the updated info
determine the latest information
303
3
/nXYZ
send the info
exeution of the transaction XYZ
304
4
refresh
send the updated info
determine the latest information
305
5
/nABC
send the UI info
exeution of the transaction ABC
306
6
send F1...Fn
send the updated info
update database table Ta according to changes on F1..Fn and send updated screen with the new calculated information

Fig. 3

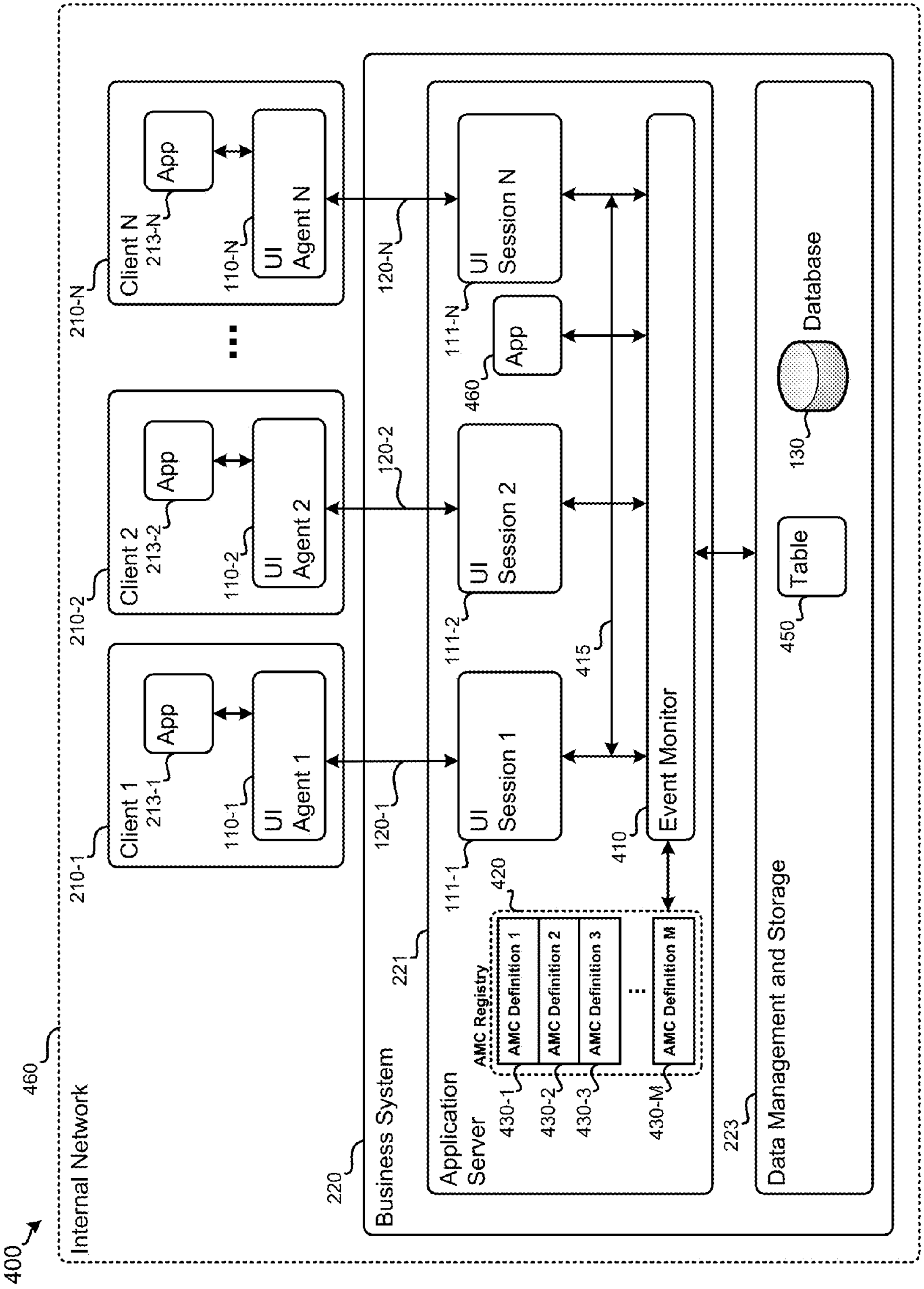

400
460
Internal Network
210-1
Client 1
213-1
App
110-1
UI Agent 1
210-2
Client 2
213-2
App
110-2
UI Agent 2
210-N
Client N
213-N
App
110-N
UI Agent N
220
Business System
221
Application Server
120-1
120-2
120-N
111-1
UI Session 1
111-2
UI Session 2
111-N
UI Session N
460
App
415
410
Event Monitor
420
AMC Registry
430-1
AMC Definition 1
430-2
AMC Definition 2
430-3
AMC Definition 3
430-M
AMC Definition M
223
Data Management and Storage
450
Table
130
Database

Fig. 4

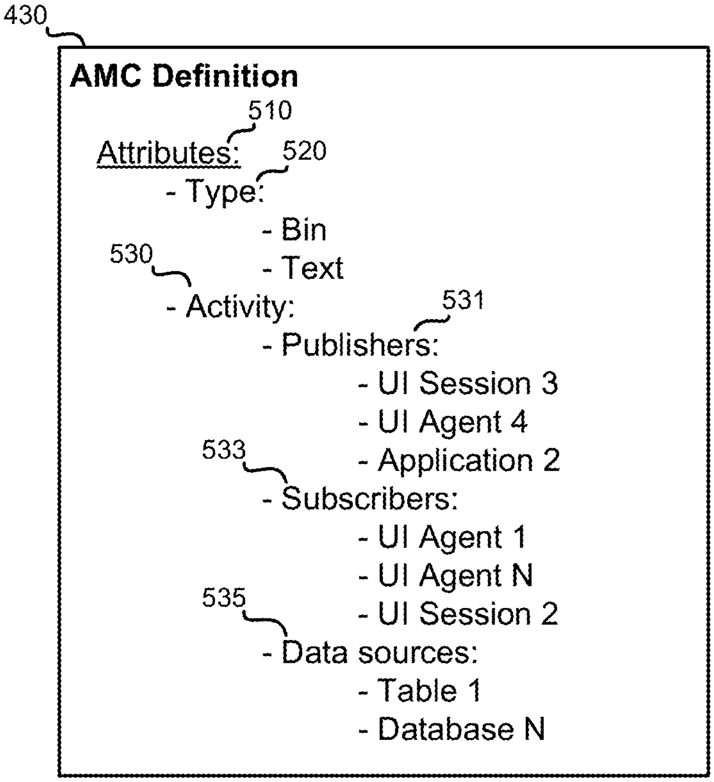

430
AMC Definition
510
Attributes:
520
- Type:
- Bin
- Text
530
- Activity:
531
- Publishers:
- UI Session 3
- UI Agent 4
- Application 2
533
- Subscribers:
- UI Agent 1
- UI Agent N
- UI Session 2
535
- Data sources:
- Table 1
- Database N

Fig. 5

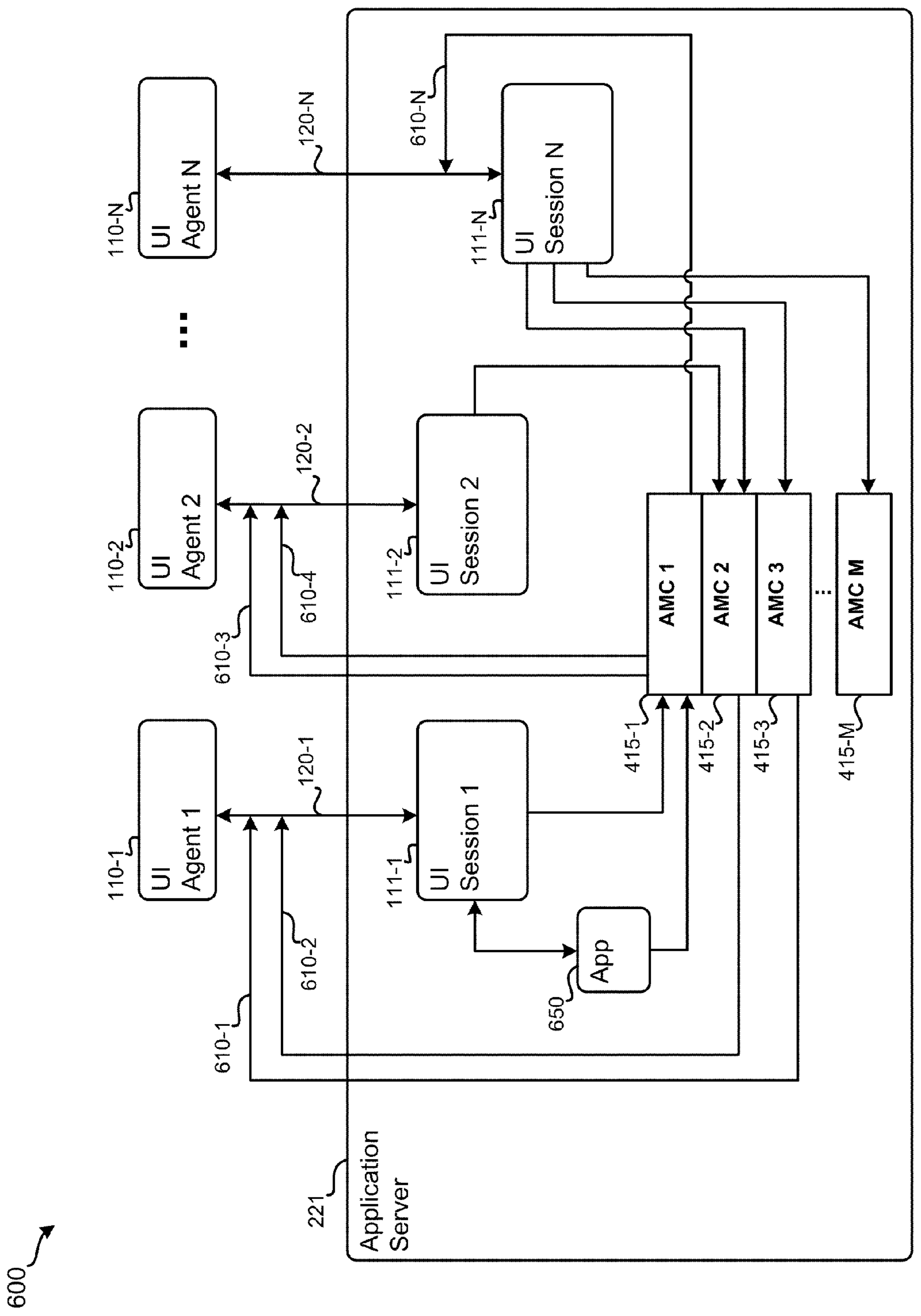

600
221
Application Server
UI Agent 1
110-1
UI Agent 2
110-2
...
UI Agent N
110-N
120-1
120-2
120-N
UI Session 1
111-1
UI Session 2
111-2
UI Session N
111-N
App
650
610-1
610-2
610-3
610-4
610-N
AMC 1
AMC 2
AMC 3
...
AMC M
415-1
415-2
415-3
415-M

Fig. 6

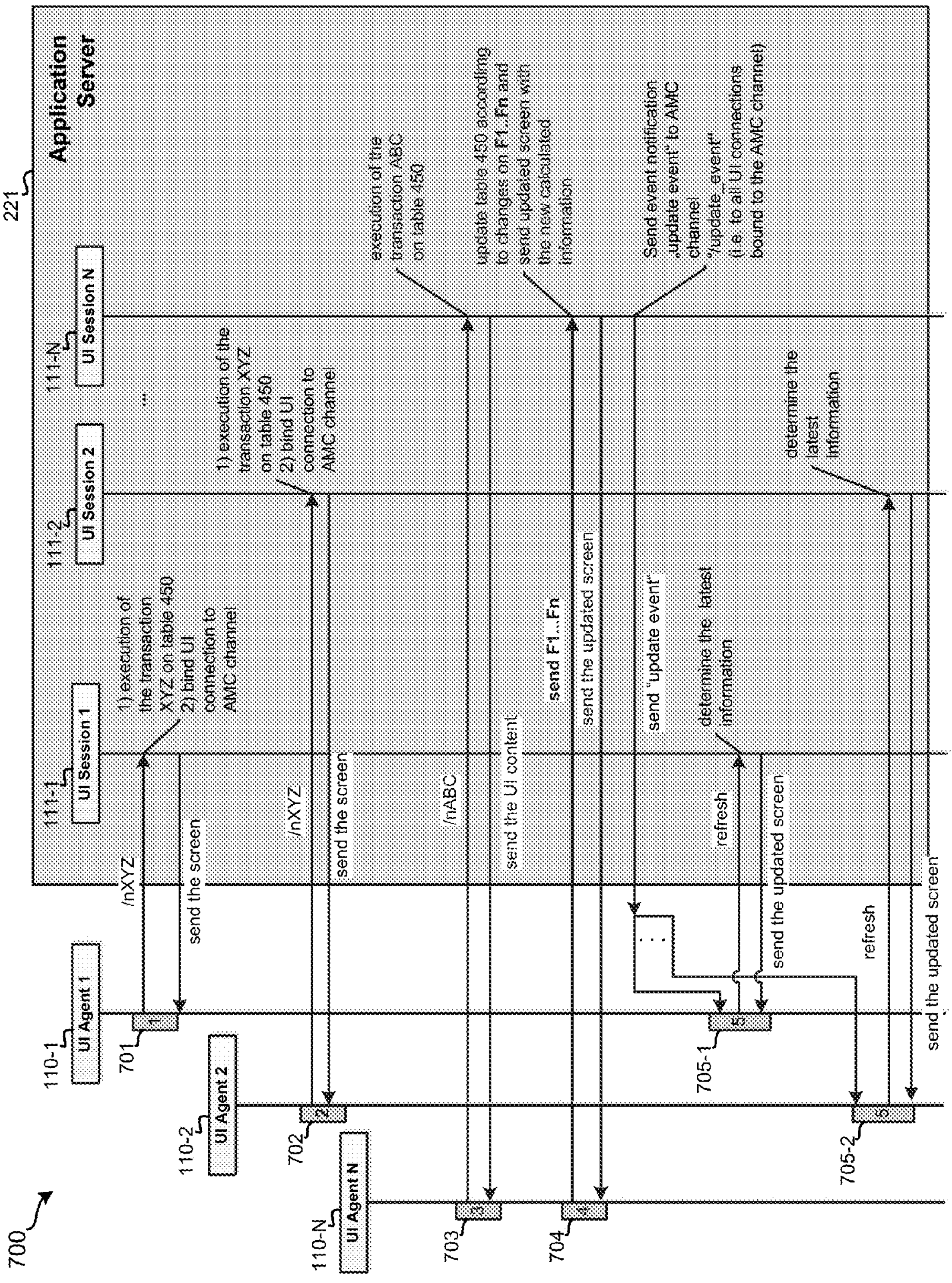

700
110-1
UI Agent 1
701
110-2
UI Agent 2
702
110-N
UI Agent N
703
704
705-1
705-2
221
Application Server
111-1
UI Session 1
111-2
UI Session 2
111-N
UI Session N
...
/nXYZ
send the screen
1) execution of the transaction XYZ on table 450
2) bind UI connection to AMC channel
/nXYZ
send the screen
1) execution of the transaction XYZ on table 450
2) bind UI connection to AMC channel
/nABC
send the UI content
execution of the transaction ABC on table 450
send F1...Fn
update table 450 according to changes on F1..Fn and send updated screen with the new calculated information
send the updated screen
send "update event"
Send event notification „update event" to AMC channel "update_event" (i.e. to all UI connections bound to the AMC channel)
refresh
determine the latest information
send the updated screen
refresh
determine the latest information
send the updated screen
1
2
3
4
5
5

Fig. 7

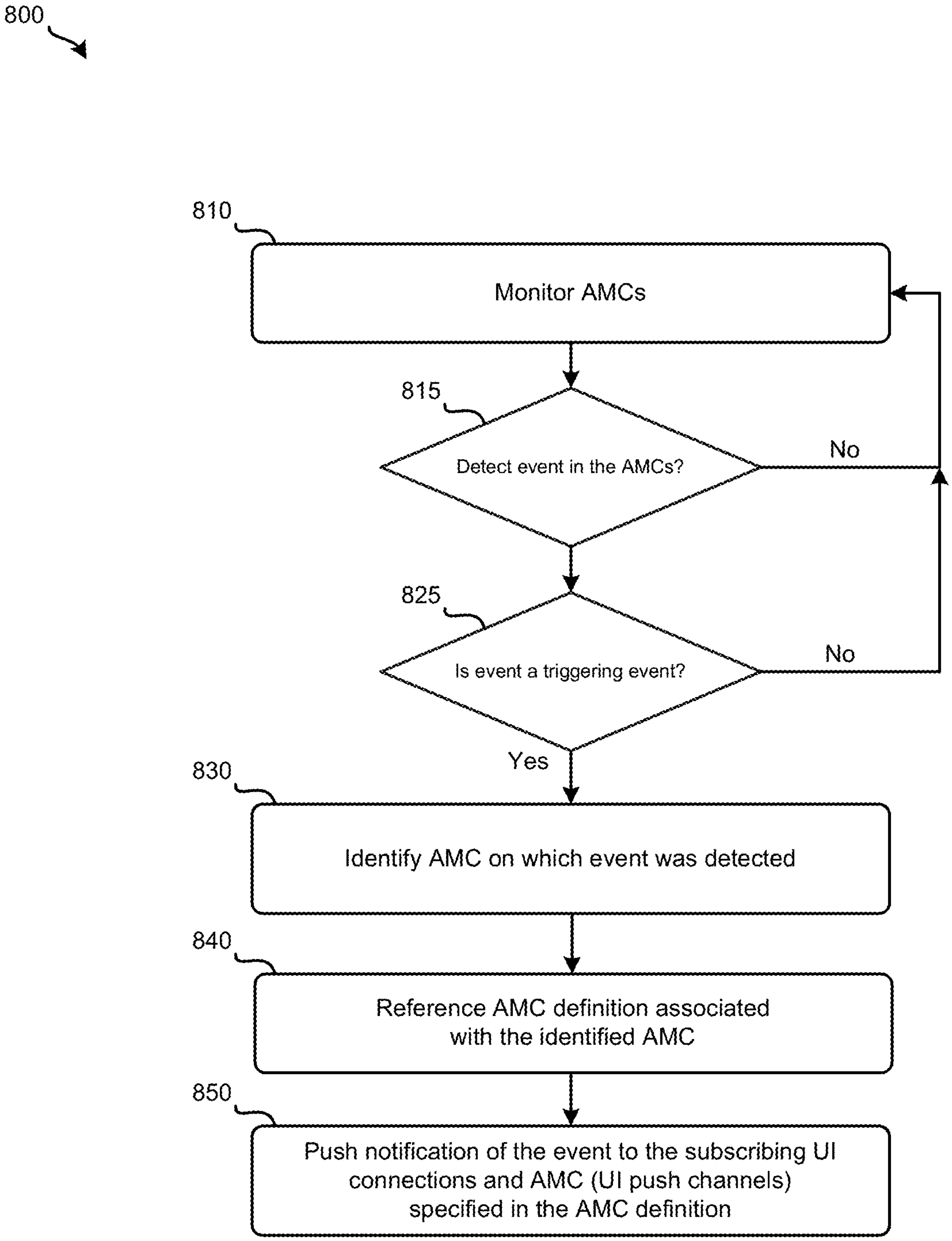

800
810
Monitor AMCs
815
Detect event in the AMCs?
No
825
Is event a triggering event?
No
Yes
830
Identify AMC on which event was detected
840
Reference AMC definition associated with the identified AMC
850
Push notification of the event to the subscribing UI connections and AMC (UI push channels) specified in the AMC definition

Fig. 8

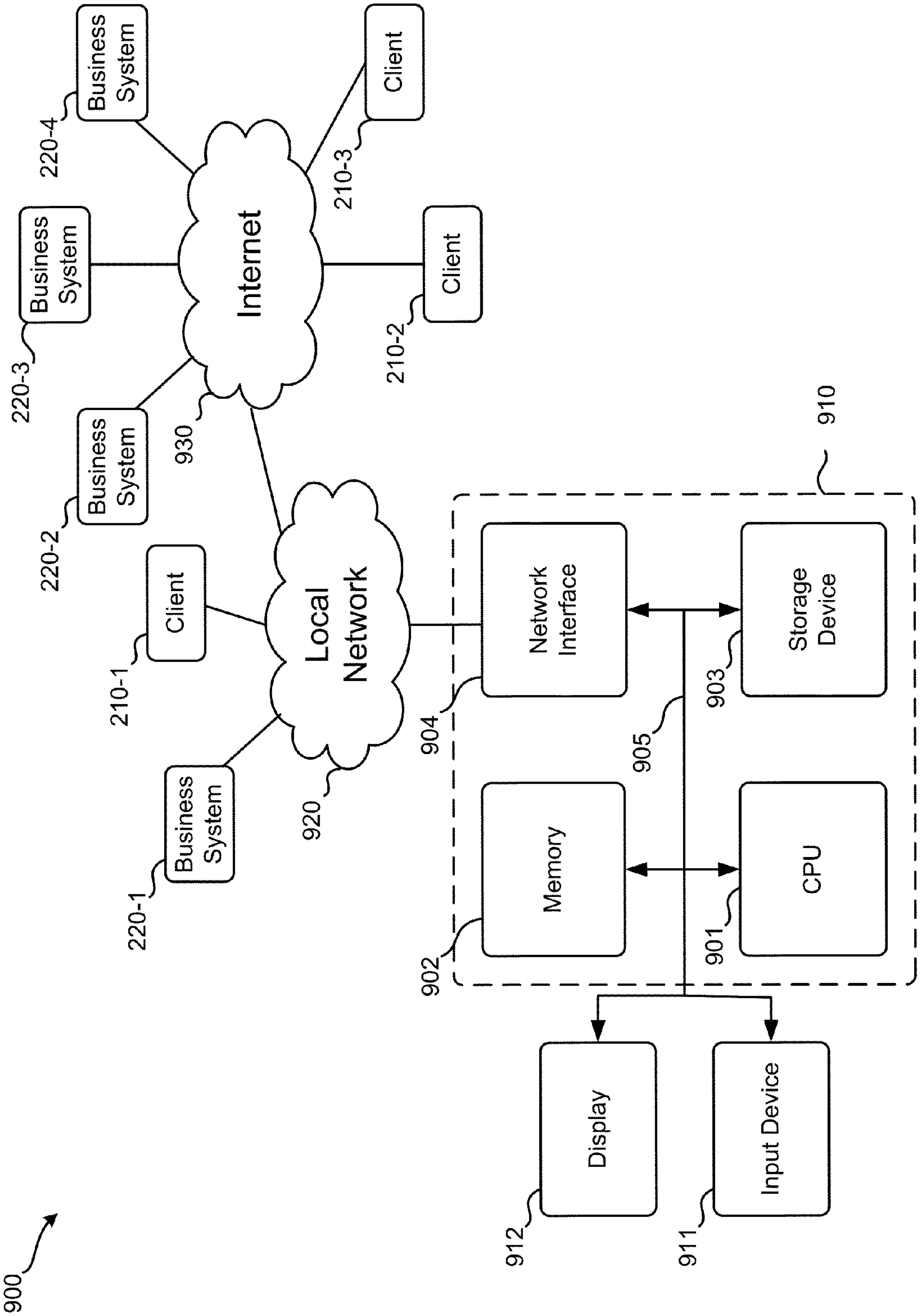

900
Business System
220-1
Client
210-1
Local Network
920
Business System
220-2
930
Business System
220-3
Internet
Business System
220-4
Client
210-3
Client
210-2
910
Network Interface
904
Storage Device
903
905
Memory
902
CPU
901
Display
912
Input Device
911

Fig. 9

USER INTERFACE PUSH CHANNEL

BACKGROUND

Unless otherwise indicated herein, the approaches described in this section are not prior art to the claims in this application and are not admitted to be prior art by inclusion in this section.

Client-server system configurations provide for centralized data management and storage (e.g., databases, tables, etc.). Typically, centralized data management and storage systems are implemented on a server computer or in a cloud computing environment that can communicate over one or more proprietary or open networks. Client computing devices (e.g., desktop computers, laptop computers, tablet computers, etc.) executing a client application specifically designed to communicate with the centralized data management and storage system can securely connect to the system over the networks.

In general, the purpose of the client application is to provide users with access (e.g., read, write, update, etc.) to data stored in a remote system (e.g., a business system). For example, a user, through the client application, might request that the information in a particular data table in the centralized data management and storage system be displayed in a UI on his client computing device. Information from the particular table may be displayed to the user in a particular graphical user interface (GUI). To handle the user input received from the user, render the GUI, and populate the GUI with the information from the table, some systems implement a UI agent-UI session configuration. In such configurations, the UI agent is instantiated on the client computing device and communicates with a corresponding UI session instantiated in remote application server with access to the centralized data management and storage system. The UI session handles requests from the UI agent for information or analysis of information in a data source, and in response, executes corresponding transactions on the data stores. The UI session may then send the resulting information back the UI agent to be displayed in the UI.

Because of the request-response nature of communication between the UI agent and the UI session, the information displayed in the corresponding GUI is only valid as long as the underlying data in the data source is unchanged. Because the data table may be available to a number of client computing devices simultaneously, it is possible that the data in the data source may be changed, updated, or deleted after the transaction for information was completed and the information is displayed. In particular, the information displayed in a GUI may no longer accurately represent the data if another UI session, or other application, has performed altering transactions (e.g., write, update, or replace functions) on the data source since the information was obtained. To ensure that the information displayed in the GUI includes the most timely data from the underlying data table, is often necessary to manually or periodically re-execute or update the transaction in order to obtain the most current data from the data table. Manually or periodically re-executing or updating the transaction can cause undesirable overuse of the available computing and network resources at all levels. The overuse of computing and network resources not only diminishes the performance of the centralized data management and storage system, but also decreases the user experience in the form of lag and delays.

SUMMARY

The present invention relates to systems and methods for accessing information stored in a central data source, and in particular, to systems and methods for a user interface (UI) push channel for sending event notifications to one or more UIs that may trigger automatic updates of the displayed information when another UI or application initiates changes to the information in the central data source.

Embodiments of the present invention improve UIs for accessing information in centralized data management and storage systems by establishing UI push channels through which notifications of changes to the data can be sent to trigger updates to information displayed. In one embodiment the present invention is directed toward a method that includes instantiating a first user interface (UI) session in communication with a corresponding first UI agent instantiated in a first client computing device through a first UI connection. The first UI session handles transactions for information from a data source for the first UI agent, and wherein the first UI agent displays a first UI comprising the information from the data source on the client computing device. The method may also include associating the first UI connection with an application messaging channel (AMC), the AMC comprising an interface for communicating between the first UI session and a plurality of other UI sessions instantiated in the computer system, receiving on the AMC a notification of an event in the data source from one of the other UI sessions, and sending the notification of the event to the first UI agent through the first UI connection.

In one embodiment, the method may also include receiving, through the first UI session, an update request from the first UI agent for updated information in response to the notification of the event, and processing, by the first UI session, the update request to generate the updated information from the data source, and sending, by the first UI session, the updated information to first UI agent.

In one embodiment, associating the first UI connection with the AMC includes storing a UI connection identifier for the UI connection and an AMC identifier for the AMC in an AMC registry, wherein the AMC registry comprises a plurality of AMC definitions, wherein each of the plurality of AMC definitions comprises an AMC identifier associated with at least one UI connection identifier or a corresponding UI agent identifier.

In one embodiment, sending the notification of the event includes referencing the AMC definition in the AMC registry associated with the AMC identifier of the AMC on which the notification of the event was received to determine one or more subscriber UI connections or one or more subscriber UI agents to which the notification of the event is to be published.

In one embodiment, sending the notification of the event to each of the subscriber UI connections or subscriber UI agents.

In one embodiment, the AMC includes an advanced business programming (ABAP) messaging channel.

In one embodiment, the method the first UI agent includes an SAP graphical user interface (GUI), wherein the first UI session comprises an SAP GUI session, and wherein the UI connection comprises an SAP GUI connection, and wherein the notification of the event comprises an SAP dynamic information and action gateway (DIAG) protocol message.

Another embodiment of the present disclosure includes a non-transitory computer readable medium instructions stored thereon, that when executed by a computer processor cause the computer processor to be configured for instantiating a first user interface (UI) session in communication with a corresponding first UI agent instantiated in a first client computing device through a first UI connection. The first UI session handles transactions for information from a data source for the first UI agent, and the first UI agent displays a first UI comprising the information from the data source on the client computing device. The instructions may further cause the computer processor to be configured for associating the first UI connection with an application messaging channel (AMC), the AMC includes an interface for communicating between the first UI session and a plurality of other UI sessions instantiated in the computer system, receiving on the AMC a notification of an event in the data source from one of the other UI sessions, and sending the notification of the event to the first UI agent through the first UI connection.

Yet another embodiment of the present inventions includes a system having a computer processor and a non-transitory computer readable medium coupled to the computer processor. In such embodiments, non-transitory computer readable medium includes instructions that when executed by the computer processor causes the computer processor to be configured to: instantiate a first user interface (UI) session in communication with a corresponding first UI agent instantiated in a first client computing device through a first UI connection, wherein the first UI session handles transactions for information from a data source for the first UI agent, and wherein the first UI agent displays a first UI comprising the information from the data source on the client computing device; associate the first UI connection with an application messaging channel (AMC), the AMC comprising an interface for communicating between the first UI session and a plurality of other UI sessions instantiated in the computer system; receive on the AMC a notification of an event in the data source from one of the other UI sessions; and send the notification of the event to the first UI agent through the first UI connection.

The following detailed description and accompanying drawings provide a better understanding of the nature and advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a UI for displaying information from a central data source that may be improved by embodiments of the present disclosure.

FIG. **2** illustrates a system for displaying information from a central data source that may be improved by embodiments of the present disclosure.

FIG. **3** illustrates a dataflow for displaying information from a central data source that may be improved by embodiments of the present disclosure.

FIG. **4** illustrates an example system for a UI push channel according to one embodiment of the present disclosure.

FIG. **5** illustrates an example application messaging channel (AMC) definition according to one embodiment of the present disclosure.

FIG. **6** illustrates an example system of UI push channels according to one embodiment of the present disclosure.

FIG. **7** illustrates an example dataflow for establishing and using UI push channels according to various embodiments of the present disclosure.

FIG. **8** is a method for sending event notifications over UI push channels according to one embodiment of the present disclosure.

FIG. **9** illustrates an example computer system and network of client computing and business system that may be used to implement various embodiments of the present disclosure.

DETAILED DESCRIPTION

Described herein are techniques for UI push channels. In the following description, for purposes of explanation, numerous examples and specific details are set forth in order to provide a thorough understanding of the present invention. It will be evident, however, to one skilled in the art that the present invention as defined by the claims may include some or all of the features in these examples alone or in combination with other features described below, and may further include modifications and equivalents of the features and concepts described herein.

OVERVIEW

Various embodiments of the present disclosure include systems and methods for establishing UI push channels. Such embodiments may include pushing notifications of changes to underlying data sources through the UI push channels to user interfaces (UIs) that are currently displaying information from those data sources. In response to the pushed notifications, the client and/or server based components can initiate and execute appropriate transactions to update the information displayed in the UIs.

One example embodiment includes a client-server implementation of a centralized data management and storage system. In such embodiments, a number of client computing devices are in communication with a central computer system (e.g., enterprise resource planning or customer relationship management systems). The central computer system, also referred herein as a business system, may be implemented in a centralized server computer or a distributed cloud computing environment. To access information stored on a business system, a client computing device may instantiate a UI agent that is in communication with a corresponding UI session instantiated in the business system (e.g., in an application server) through a corresponding UI connection. The UI agent handles receiving requests from users for information (e.g., requests to read, write, edit, display, or otherwise manipulate) from a particular data source (e.g., a centralized database or table), sending the appropriate transaction requests to the UI session, and displaying the resulting information in a corresponding UI on the client computing device. The UI session handles the execution of the transactions on the data source requested by the UI agent and, in response, sends the resulting information back to the UI agent. The UI connection may include an electronic communication link dedicated to sending/receiving requests/information between the UI agent and the UI session.

For example, the UI agent may send a request to the UI session through the UI connection to execute an "aggregation" transaction on a particular accounting database to obtain various aggregates of invoice amounts stored in the database for the current month. The UI session may then execute the aggregation transaction on the accounting database and return the resulting aggregated invoice amounts to the corresponding UI agent through the corresponding UI connection. The UI agent may then display the aggregated invoice amounts in a corresponding graphical user interface (GUI).

To establish a UI push channel, the UI agent, the UI connection, or the UI session used to handle a transaction can be bound to or "subscribe" to a particular application messaging channel (AMC) associated with the data source and/or a publisher UI agent, UI session, or UI connection that initiate or execute transactions on the data source. Accordingly, whenever another entity (e.g., a publisher UI session or application instantiated in the business system) executes a transaction on the data source, an event notification can be broadcast to any and all subscribers through the associated AMC. The pathways through the associated AMC and UI connections to the subscribers are referred to herein as UI push channels. Based on the event notification received through the

UI push channel, the subscribers of particular AMC may update the information displayed in the corresponding UI.

In one embodiment, broadcasting the event notification of either a potential or actual change through the appropriate UI push channel includes forwarding the event notification to the corresponding subscriber UI agent. In such embodiments, the UI agent may determine if the notification involves a change to the data source that requires actions performed by the UI agent or the UI session. For most changes to the underlying data source, the UI agent will send an update or a refresh request to the corresponding UI session. In response to the update or refresh request, the UI session will re-execute the transaction that produced the information displayed in the GUI. Such embodiments eliminate the need for a refresh button to be included in the GUI by ensuring that the information displayed in the GUI is always current.

Because each refresh request requires the UI agent to generate and send a request to the UI session, and for the UI session to re-execute the transaction and send the results back to the UI agent, unnecessary refresh requests (i.e., refresh requests that occur before the underlying data source is altered) can result in undesirable consumption of computing and network resources. By eliminating the need for unnecessary refresh requests, various embodiments of the present disclosure can improve the performance of centralized data management and storage systems, while also improving the efficacy of the UI by providing the most current data and improving the end-user experience by reducing the amount of lag in the system observed by users.

UI for Accessing Centralized Data Storage and Management Systems

To illustrate the advantages of the embodiments described above and other features of the present disclosure, some example systems that may be improved by the present disclosure will now be discussed in detail.

FIG. **1** illustrates an example UI **100-1** that may be improved by various embodiments of the present disclosure. As shown, the UI **100-1** may include a number of fields and controls **111** and **113** and visual analytics **115** for displaying information retrieved from a database **130**. To populate the fields and controls **111** and **113** and the visual analytics **115**, the UI **100-1** may send a transaction to operate on a database **130** through the UI connection **120**. The transaction can include transactions that read, update, or change information in this database **130**. In response to the transaction, the UI **100-1** may receive a response that includes the requested or necessary information from the database **130** for populating the various fields and controls **111** and **113** and visual analytics **115**. Typically, once the fields and controls **111** and **113** and the visual analytics **115** are populated with information from the database **130**, the display of information does not change for as long as the UI **100-1** is displayed.

Meanwhile, another UI **100-2**, as well as other applications, may also request/send transactions that operate on the database **130**. Just as the UI **100-1** may send transactions to the database **130** that read, update, or change information in the database **130**, so can UI **100-2** and the other applications. Accordingly, after the UI **100-1** is populated with the information resulting from the requested transaction, the information in the underlying database **130** may change. As such, any information statically displayed in the UI **100-1** may not be the most current information stored in database **130** due to subsequent transactions of other UIs and applications.

To assist users to view the most current information from database **130**, some UIs **100-1** may include a refresh button **105**. When the refresh button **105** is operated by a user, the UI **100-1** may resend the transaction to be operated on the database **130** to generate and respond with the necessary information to repopulate the controls and fields **111** and **113** and visual analytics **115** with the most current information. Alternatively, the UI **100-1** may be configured to periodically refresh the information at predetermined intervals. The information from a manual or periodic refresh may or may not be different from the information obtained by the original execution of the transaction. As such, there is significant potential for unnecessary refreshes.

Systems for Accessing Information in Centralized Data systems

FIG. **2** illustrates a system **200** for accessing information in a centralized data management and storage system **223** in which various embodiments of the present disclosure may be implemented. As shown, the system **200** may include a number of the client computing devices **210** and a business system **220**. In one example embodiment discussed in more detail herein, the business system **220** may be in communication with the client computing devices **210** through one or more electronic communication protocols or media. The business system **220** may include or be in communication with a data management and storage system **223** using various electronic communication media and protocols.

In one specific example, the business system **220** may include any number of products or business systems offered by SAP AG. Accordingly, the application server **221** may be implemented as an instance of a SAP™ NetWeaver™ Advanced Business Application Programming (ABAP) engine. The UI sessions **111** instantiated in the application server **221** may be implemented as instances of SAP GUI sessions, while the UI agents **110** may be implemented as instances of SAP GUI agents. In such embodiments, the UI agents **110** may be in communication with the UI sessions **111** over a UI connection **120**, such as an SAP GUI connection. The SAP GUI connection may include an implementation of a dynamic information and action gateway (DIAG) protocol.

The DIAG protocol is a TCP/IP protocol implemented by SAP for facilitating communication between an SAP system, such as the NetWeaver™ ABAP engine, and a diverse selection of frontend components, such as SAP GUI for Windows or Java. As such, the UI connection **120** implemented to include the DIAG protocol may include support for dynpro messages and remote function call (RFC) messages. Dynpro is a message format delivers data that represents UIs or screens of data. For example, a dynpro message can define a particular screen that is displayed as a UI. RFCs are a type of message that supports synchronous and asynchronous communication between various systems (SAP and non-SAP) for requesting functions to be executed in a remote system.

To facilitate communication between the UI sessions **111**, various embodiments of the present disclosure may use ABAP messaging channels (not shown). The ABAP messaging channels, or more generically, application messaging channels (AMC) include a method of communication between ABAP and non-ABAP programs instantiated in the application server using messages. Messages can be exchanged between any program, including communication among UI sessions **111** and other applications. While the SAP™ implementations of various components of the system **200** are possible, embodiments of the present disclosure are not limited to the offerings of SAP™. Accordingly, one of ordinary skill in the art will realize system **200** may include various types of client-server based centralized data management and storage systems that utilize application messaging channels (AMCs) for communication among the UI sessions **111** and other applications in the application server **221**.

As shown, each UI agent **110** may communicate with its corresponding UI session **111**, instantiated in the application server **221**, over a corresponding UI connection **120**. Because each client **210** may be operated by a separate user, the UI agents **110** may send a number of transaction/refresh requests to their associated UI sessions **111** in parallel. Each UI session **111** may then operate on common or different data sources in the data management and storage system **223**. When the UI sessions **111** operate on the same data source, complications arise that may cause the information displayed by one or more of the UI agents **110** to be out of date. For example, as discussed above, one UI agent **110-1** may request its corresponding UI session **111-1** to execute a transaction to retrieve the current information (i.e., the amount of a particular invoice) stored in a particular data source so that it can be displayed in a corresponding UI on client computing device **210-1**. Meanwhile another UI agent **110-3** may request that its UI session **111-3** execute a transaction to update, change, or delete the information (i.e., edit the amount of the invoice) in the same data source according to business transactions initiated by or observed by the user of the corresponding client computing device **210-3**. At that time, the information displayed by the UI agents **110-1** will be out of date because it does not show the updated or deleted information in the data source as edited by the UI session **111-3**.

Data Flows for Accessing Information in Centralized Data Storage and Management Systems

FIG. **3** illustrates a data flow **300** typically used by multiple UI agents **110** and UI sessions **111** for providing up-to-date information in corresponding UIs that may cause negatively affect the performance of a given business system or centralized data management and storage system. In the specific example shown in FIG. **3**, the data flow describes a number of transactions and responses between N corresponding UI agents **110** and UI sessions **111**. In this context, N represents a natural number.

To retrieve the most up to date information in a particular data source, each one of the UI agents **110** would need to send a refresh request to the corresponding UI session **111** to update the previously requested information by re-executing the previously requested transaction. For example, at box **301**, the UI agents **110-1** may send the transaction request ("/nXYZ") to its corresponding UI session **111-1**. In response to the request, the UI session **111-1** can execute the transaction /nXYZ and return the resulting information to the UI agent **110-1**. The UI agent **110-1** may then display the information in a corresponding UI. At some later time, represented here as box **302**, the same UI agent **110-1** may send a refresh request to the corresponding UI session **111-1**. In response to the refresh request, the UI session **111-1** may update the previously generated information and return it back to the UI agent **110-1** so that the UI may be updated.

Similarly, at box **303**, UI agent **110-3** may send the transaction /nXYZ to the corresponding UI session **111-2**. The UI session **111-2** may execute the transaction /nXYZ and return the resulting information to the UI agent **110-2**. At a later time, at box **304**, UI agent **110-2** may send a refresh request to UI session **111-2** to ensure that the information displayed in the UI is the most current information in the data source. In response to the refresh request, UI session **111-2** may send the updated information back to the UI agent **110-2**. Such activity can occur for as many as N UI agent-UI session pairs that ultimately operate on a common data source. Accordingly, the UI agent **110**-N, at box **305**, may send a transaction /nABC to its corresponding UI session **111**-N. In response, the UI session **111**-N can send the UI content requested according to the transaction /nABC back to the UI agent **110**-N.

As previously discussed, any of the UI agents **110** may initiate transactions that alter or edit the data in the underlying data source. For example, at box **306**, the UI agent **110**-N may send transactions or functions F1 . . . Fn to UI session **111**-N for operation on various pieces of data stored in the data source from which UI sessions **111-1** and **111-2** from which previously populated. For example, the functions F1 . . . Fn may change fields 1 . . . n in a given database. Once the changes are made in the data source, the UI session **111**-N may return the updated information based on the altered data back to the UI agent **110**-N. If any of the data altered by the functions F1 . . . Fn affects the information in transaction /nXYZ, then the UI agents **110-1** and **110-2** would need to send refresh requests in order to update the information displayed in the corresponding UIs to represent the current information.

While the refresh requests may be initiated manually in response to a user input, (e.g., operation of a refresh button in the UI) or automatically (e.g., automatic refreshes executed periodically or in response to polls to the data source), there is no way for each individual user, UI agent **110** or UI session **111** to know when to the underlying data source has been changed. As a result, many refresh requests are initiated and executed when it is unnecessary (i.e., executed even when the underlying data source is unchanged). As such, it is clear that the unnecessary refresh requests can waste computing and communication resources at the client level and at the business system level. Such wasted computing and communication resources may negatively impact the performance of the centralized data storage and management systems **221**. Embodiments of the present disclosure avoid such impacts on performance by avoiding unnecessary refreshes by only performing updates or refreshes when the application server **220**, or other component determines that a transaction or function has been executed that may change the underlying data.

Systems for Accessing Current Information Using UI Push Channels

FIG. **4** illustrates an improved system **400** for accessing information in a centralized data management and storage system **223** according to various embodiments of the present disclosure. In such embodiments, the application server **221** may include an instance of event monitor **410**. The event monitor may communicate with the UI sessions **111** using one or more AMCs **415**. By analyzing transactions, and other functions, from UI sessions **111** and applications **460** received through AMC **415**, the event monitor **410** may determine when potential changes to information stored in the data management and storage system **223** might occur. For example, the event monitor **410** may analyze the transactions executed by UI sessions **11** for operations that add, delete, or modify the information in one or more data sources in the centralized data management and storage system **223**, such as table **450** and database **130**. The features and advantages of system **400** are discussed in more detail below.

As shown, the UI sessions **111** instantiated in the application server **221** (e.g., a NetWeaver™ ABAP Engine) can execute transactions on data sources in the data management and storage system **223** through the event monitor **410** and the AMCs **415**. While the AMCs **415** are illustrated in FIG. **4** as a single common connection between the UI sessions **111**, application **460** and the event monitor **410**, it should be understood that the AMCs **415** may be implemented as specific communication channels between specific UI sessions **111**, application **460**, and the event monitor **410**.

For example, one possible AMC may be dedicated to communication between UI session **111-1** and UI session **111**-N, while another possible AMC may be dedicated to communication between UI session **111-2** and application **460**. In addition, individual AMC paths may be created using an addressing protocol when executing transactions and sending messages over AMC **415**. In particular, each message or transaction that a UI session **111** sends may include one or more identifiers to designate to which UI sessions **111**, application **460**, or data source the message or transaction should be delivered. For instance, UI session **111-2** may send a transaction to add information to table **450** and a message alerting UI session **111**-N that a change will be made to the table **450**. In such a scenario, UI session **111-2** may include an identifier associated with table **405** and an identifier associate with UI session **111**-N in the transaction/message that it sends out on AMC **415** and/or event monitor **415**.

In some embodiments, an AMC **415** may be predefined to communicate transactions/messages to and from specific subscribers or recipients. An AMC definition **430** may specify that the corresponding AMC **415** be dedicated to sending message from source UI session **111**, also referred to herein in as a publisher, to one or more subscriber UI sessions **111**, also referred to herein as a subscribers. Thus, any message that the publisher, such as UI session **111-2**, sends out on the AMC **415** defined in the associated AMC definition **430-2** will be sent to the UI sessions **111-1** and UI session-N, as may be designated in the UI definition **430-2**.

Similarly, an AMC definition **430** may also specify a subscriber data source on which transactions should operate when sent over the corresponding AMC **415**. For instance, a UI session **111-1** may send an aggregation transaction over an AMC **415** defined in AMC definition **430-3** that designates database **130** as the target data source.

Accordingly, in some embodiments, each UI session **111** or application **460** may include an AMC identifier associated with an AMC definition **430** with each transaction or message that it sends. Based on the AMC definition **430**, the transactions or messages may be routed over the desired AMC **415** to the desired UI session **111**, application **460**, or data source. The AMC definition **430** associated with the designated AMC identifier can be used by the application server **221**, event monitor **410**, or other element of the business system **220**, to determine the specific AMC **415** one which a particular transaction or message was sent. For example, the event monitor **410** may use the AMC identifier associated with or included with a particular transaction to refer to the corresponding to AMC definition **430**-M in order to detect which AMC **415** was used send the transaction and to which other entities may need to be informed of the transaction. For instance, AMC definition **430**-M may indicate that UI session **111-2** and application **460** are subscribers to the corresponding AMC **415**, and database **130** is the target data source.

In one example, a UI session **111-1** may be supporting a corresponding UI agent **110-1** in client computing device **210-1** (e.g., a desktop computer) used by a customer support representative that displays a UI that shows current shipping statuses based on information in shipment database **130**. UI session **111-2** may support a UI agent **111-2** in a handheld mobile client computing device **110-2** (e.g., a handheld scanner) used by a delivery person for entering or updating the shipment statuses in the shipment database **130**. When the UI session **111-2** receives a transaction request from the handheld mobile client computing device **110-2**, it may send a transaction associated with an AMC identifier that corresponds to an AMC definition **430-2** that designates the shipment database **130** as the target data source, and UI session **111-1** as a subscriber. In accordance with the AMC definition **430-2**, the event monitor **410** may send an event notification to the UI session **111-1** that the shipment status information in the shipment database **130** may have been changed. In response to the notification, the UI session **111-1** may re-execute or refresh the transaction that it uses to obtain the current shipment status shown in the corresponding UI.

As illustrated above, based on the AMC definitions **430** in the AMC registry **420** associated with the detected AMC identifiers, the event monitor **410**, or other component of the application server **221**, may broadcast a notification of a particular event over one or more AMCs **415** to one or more subscribers. In some embodiments, in addition to listing UI sessions **111** UI as subscriber, an AMC definition may also list connections **120**, UI agents **110**, or applications **460** as subscribers.

To determine over which AMC **415** and to which UI agents **110**, UI connections **120**, or UI sessions **111** to broadcast the notification of the event, the event monitor may first determine which UI agents **110**, UI connections **120**, or UI sessions **111** may be interested in receiving such notifications. To determine over which AMC **415** to broadcast the event notification, the event monitor **410** may analyze each transaction before, while, or after it is executed on the target data source. The analysis of the transaction may include detecting identifiers associated with the UI agent **110**, UI session **111**, or the corresponding UI connection. The event monitor **410** may then reference the AMC registry **420** to retrieve any AMC definitions **430** that are associated with the identifiers.

Referencing the AMC registry **420** may include accessing a number of AMC definitions **430**. Accessing the AMC definitions **430** may be accomplished in a number of ways. In one embodiment, each AMC definition **430** may include a listing of publishers to the corresponding AMC **415**. Similarly, each AMC definition **430** may include a listing of subscribers to the corresponding AMC **415**. In addition, each AMC definition may also include a listing of target data sources and/or transaction types. For example, one of the AMC definitions **430-1** may define UI agent **110-1** or UI connection **120-1** as subscribers to the corresponding AMC **415**. That same AMC definition **430-1** may also define UI session **111-2** and application **460** as publishers to the corresponding AMC **415**. The AMC definition **430** may also define table **450** as the target data source of concern. Accordingly, any time UI session **111-2** or application **460** executes a transaction on table **450**, the event monitor **410** may determine, based on the AMC definition **430-1**, to broadcast a notification to UI agent **110-1** or UI connection **120-1** over the corresponding AMC **415**.

In some embodiments, the types of transactions that trigger the event monitor **410** to reference the AMC registry **420** to determine a number of AMCs over which to broadcast one or more notifications can be defined at the individual AMC definition **430** level or at the global level. Accordingly, in embodiments in which the transaction type that triggers the event monitor **410** to reference the AMC registry **420** is a global setting, all transactions that cause information in one or more target data sources in the data management and storage system **223** to change (e.g., updates, deletions, additions, and the like) will trigger the event monitor **410** to send out event notifications according to the AMC definitions **430** in the AMC registry **420**. In such embodiments, any transactions that do not alter the underlying data in the target data source may not trigger the event monitor **400** to search for an appropriate AMC over which to broadcast the event notification. Alternatively, every transaction or event may trigger the event monitor **410** to reference the AMC registry **420** to determine an appropriate AMC over which to broadcast a notification of the transaction or other event.

In one embodiment, to accurately reference the AMC definitions **430** in the AMC registry **420**, the event monitor **410** may detect certain attributes of the functions or transactions. In some embodiments, the transactions or functions executed through the event monitor **410** may include information regarding the target data source, the type of functions to be executed on that data source, as well as the originating UI agent **110**, UI connection **120**, and UI session **111**. For example, when the UI session **111** executes an information request transaction on a data source in the data management and storage system **223** through the event monitor **410**, the event monitor **410** may determine identifiers associated with the UI agent **110**, the UI connection **120** and/or the UI session **111** from which the transaction was initiated or executed. Based on the information determined from the transaction, the event monitor **410** may reference the AMC registry **420** to determine a number of applicable AMC definitions **430**. Using the identifiers determined from the executed transaction, the event monitor **410** may access the appropriate AMC definitions **430** and then use them for determining the appropriate AMCs **415** over which to broadcast any potential event notifications.

When a potentially interested component, such as a UI agent **110**, UI connection **120**, or UI session **111** receives an event notification from the event monitor **410**, it may determine individually what to do with or in response to the notification. In some embodiments, the UI agent **110** may first determine whether the prescribed action in response to the event notification may be performed by the UA agent **110** itself or needs to be processed by the UI session **111**. For example, a response to an event notification that a UI agent may handle on its own it to display a flag or other alert that the information on the screen is no longer current. In some embodiments, the event notification may require that the client computing device **210** launch a local application **213**. In such situations, the UI agent **110** may initiate the launch of the application **213** on its own. In contrast, however, the UI agent **110** may determine that the prescribed action in response to the event notification may only be executed by its associated UI session **111** in the application server **221**. For example, the UI agent **110** may determine that the prescribed response to the event notification is to execute another transaction (e.g., a refresh transaction) on a data source in the data management and storage system **223**. In such scenarios, the UI agent **110** would require that UI session **111** executes the transaction on its behalf and return the resulting information.

In the specific example shown in FIG. **4**, business system **400** is depicted as a client-server implementation within an internal network **460**. As such, each client computing device **210** may communicate with the business system **220** using one or more standardized or proprietary secure communication protocols or media. In addition, each client computing device **210** may require a user to enter user authentication credentials (e.g. a username and password pair) before he or she is allowed to access information within the internal network **460**. While internal network **460** is depicted as a contained secure network in which client computing devices **210** and the business system **220** are all connected to a common secure networking environment, various embodiments of the present disclosure may also include scenarios in which some of the client computing devices **210** are external to the internal network **460**. In such embodiments, client computing devices **210** may communicate with the internal network **460** through one or more intermediate networks (e.g., the Internet) using a secure networking protocol (e.g., a virtual private network (VPN)).

Application Messaging Channel Definitions

FIG. **5** depicts a particular example of an AMC definition **430**. In some embodiments, the AMC definition **430** may include a number of attributes **510** that may be used by the event monitor **410**, or other component of the business system **220**, to identify the AMC definition **430** and determine the corresponding AMC **415**. For example, the attributes **510** may include the type of message **520** that may be broadcast over the particular AMC **415**. In this particular example, both binary and text messages may be broadcast over the AMC **415** associated with the AMC definition **430**. In addition to the type of message **520** that may be sent over the AMC **415**, the AMC definition **430** may also include the activities **530** that might trigger an event notification to be broadcast over the AMC **415**. In the particular example shown, the activities **530** include listings of publishers **531**, subscribers **533**, and data sources **535**. For example, any transactions executed by UI sessions 3, UI agent 4, and application 2 that operate on data sources **535** table 1 and database N will trigger an event notification to be sent to subscribers UI agent 1, UI connection N, and UI session 2. While not shown, the AMC definition **430** may also define the types of transactions for each data source **449** that would trigger an event notification to be broadcast on the AMC **415**. For example, the AMC definition **430** may specify that only transactions that change the target data sources **535**, such as a write, edit, or delete transactions, will trigger an event notification to be broadcast over the AMC **415**.

The collection of attributes **510** in an AMC definition **430** may define a number of connections or paths between the publishers **533** and the subscriber **535** via their respective UI connections **120** (e.g., DIAG connections) and the associated AMC **415** to which they are bound. Because notifications of transactions initiated or completed through UI connections **120** associated with of the publishers **531** can be pushed to the subscribers **533** over their respective UI connections **120** and the AMC **415**, the connections or paths established are referred to herein as UI push channels. Accordingly, a UI push channel may be defined as the association between the UI connection **120** of a publisher **531**, the AMC **415**, and the UI connection **120** of a subscriber **533**. A UI push channel may thus become a channel over which notifications of transactions or functions that may potentially alter the underlying data sources **535** may be pushed to subscriber UI agents **110**, UI sessions **111** or UI connections **120**.

In some embodiments, the UI push channel can be implemented as an extension of the DIAG protocol. The DIAG protocol can be extended to include messages and pathways that are defined by the specifications of a particular AMC definition **430**.

UI Push Channels

FIG. **6** is a schematic of an example system **600** with UI push channels **610** for delivering event notifications to one or more UI agents **110**, UI session **111**, or UI connections **120**, as defined by a particular set of AMC definitions **430** in an AMC registry **420**. In the example shown in FIG. **6**, the UI push channels **610** include connections from various UI sessions **111** through AMCs **415** to the UI connections **120** defined in the corresponding AMC definition **430** or AMC registry **420**. For instance, the AMC definition **430** for AMC **415-1** may define UI session **111-1** and application **650** as publishers. Any time either one of UI session **111-1** or application **650** perform a transaction on a specified data source, an event notification may be broadcast over AMC **415-1** to the

UI connection **120**-N, thus creating UI push channel **610**-N. Similarly, the AMC definition for AMC **415-2** may define UI sessions **111-2** and **111**-N as publishers such that any transactions that UI sessions **111-2** and **111**-N execute that change the data in the specified data sources trigger an event notification. Accordingly, AMC **415-2** can be used to broadcast event notifications to the UI connection **120-1**, thus creating UI push channel **610-2**. As another example, the AMC definition associated with the AMC **415-3** may define UI session **111**-N as a producer. The AMC definition for AMC **415-3** may also specify that any transactions executed by UI session **111**-N on any data source will trigger an event notification to be broadcast to the UI connection **120-1** over AMC **415-3**, thus creating the UI push channel **610-1**. Once the event notification is broadcast over the corresponding UI push channel **610**, either the UI agent **110** or the UI session **111** can take action in response to the event notification.

Data Flows for UI Push Channels

FIG. **7** is a data flow **700** for defining UI push channels and broadcasting event notifications over those UI push channels, according to an embodiment of the present invention. The data flow **700** may begin with a UI agent **110-1** sending a request for a transaction /nXYZ (e.g., read data from a particular data source) to its corresponding UI session **111-1** in the application server **221** through the corresponding UI connection **120-1**, at box **701**. In response to the request for transaction /nXYZ, the UI session **111-1** may execute a transaction data source such as table **450** through the event monitor **410**.

In some embodiments, the event monitor **410**, or some other component of the application server **221**, may bind the UI connection **120-1** to a particular AMC **415**. The AMC **415** to which the UI connection **120-1** is bound may be determined based on an identifier associated with the UI agent **110-1**, the UI connection **120-1**, the UI session **111-1**, or the table **450**. In some embodiments, the process by which the UI connection **120-1** is bound to a particular AMC **415** may include registering the UI agent **110-1**, the UI connection **120-1**, or the UI session **111-1** as a subscriber to that particular AMC **415**. Accordingly, an AMC **415** may be dedicated to broadcasting event notifications regarding a particular data source, such as table **450**. Any element that issues transactions that alter table **450** may be the registered as a publisher in the respective AMC definition **430**. Similarly, any element that receives information from the table **450** for displaying the particular UI may be registered as a subscriber in the respective AMC definition **430**.

To continue the example above, the UI agent **110-2**, at box **702**, may issue transaction /nXYZ to its corresponding UI session **111-2** over UI connection **120-2**. In response to the transaction /nXYZ, the UI session **111-2** may execute the transaction /nXYZ on the table **450** through the event monitor **410**. Before, during, or after the transaction /nXYZ is executed, the event monitor **410**, or another component of the application server **221**, may bind UI connection **120-2** to the AMC associated with the table **450**. Accordingly, the UI connection **120-2** may also be registered in the corresponding AMC definition **430** as a subscriber.

As many as N UI agents **110**, UI connections **120**, and UI sessions **111** may be associated with a particular AMC definition **430** as publishers or subscribers. Accordingly, as illustrated in FIG. **7**, a UI agent **110**-N, box **703**, can send a request for the execution of transaction /nABC to its corresponding UI session **111**-N through UI connection **111**-N. As before, the UI session **111**-N may execute the transaction /nABC on the table **450** through the event monitor **410** and the UI agent **110**-N, the UI connection **120**-N, and/or the UI session **111**-N may be bound to the AMC associated with the table **450**. At a later time, represented here at box **704**, UI agent **110**-N can send a request to execute a number of field updates (e.g., F1 . . . Fn) to the UI session **111**-N to update or change in number of fields in the table **450**. As with other transactions, the UI session **111**-N may execute the field updates through the event monitor **410**. Based on analysis of the field updates, the event monitor **410** may note that the requested transactions will make changes to the table **450**. Accordingly, the event monitor **410** may refer to the AMC registry **420** to identify one or more AMC definitions **430** associated with UI agent **110**-N, the UI connection **120**-N, the UI session **110**-N, and/or the target table **450**. In the present example, the event monitor **410** may retrieve the AMC definition **430** associated with the table **450**, and in accordance therewith, send an event notification (e.g., /update_event) to all of the UI connections **120** bound to corresponding AMC **415**.

UI connections **120-1** and **120-2** may receive the event notification through the corresponding AMC **415** defined by the AMC definition **430**. Because the event notification may be sent to the UI connections **120-1** and **120-2**, the event notification may be handled by either the corresponding UI agents **110** or UI sessions **111**. In the specific example shown, the UI agents **110-1** and **110-2** receive the event notification boxes **705-1** and **705-2**. In response to the event notification, the UI agents **110-1** and **110-2** they send a refresh request to the corresponding UI sessions **111**. In response, the UI sessions **111** may send the updated information to be displayed in the corresponding UIs.

FIG. **8** is a flowchart of a method **804** pushing event notifications to one or more UI agents **110**, UI connections **120**, and or UI sessions **111**, according to various embodiments the present disclosure. The method **800** may begin at **810**, in which the application server, or a component therein, such as the event monitor **410**, may monitor one or more application messaging channels, or AMCs **415**, established among various UI sessions and other applications within the application server. As used herein, the term AMC is used herein to refer to any communication link with a protocol that supports communication between applications instantiated in the application server **221**. In addition, an AMC **415** may facilitate communication between the UI session **111** and a data management and storage system **223**. In one embodiment, the AMC **415** may include the ABAP communication channel protocol from SAP™ AG.

The application server **221** may continue to monitor the AMC **415** until an event is detected in determination **815**. In one embodiment, a detected event may include a transaction executed by a UI session **111** on one or more data sources, such as database **130**. In determination **825**, the application server **221** may determine whether or not the detected event is a triggering event. If the event is not a triggering event, then the application server **221** may continue to monitor the AMCs **415**. A triggering event may include detecting a transaction operated on a data source that causes the data in the data source to be altered or changed in some way. For example, a transaction that updates or changes a number of fields in the table **450** may qualify as a triggering event. Similarly, a transaction that deletes records in a database **130** may also qualify as a triggering event. In general, any transaction that changes the underlying data in a data source accessed by a particular UI agent **110** and or UI session **111** may qualify as a triggering event, such that a corresponding UI displayed on one or more client computing devices **210** may need to be updated in response to the changes in the underlying data.

If the event is a triggering event, then the application server **221** may continue to action **830** to identify the AMC **415** on which the event was detected. In some embodiments, identifying the AMC **415** may include identifying and identifier associated with the AMC **415** over which a triggering event was detected.

In other embodiments, identifying the AMC **415** may include referencing an AMC registry **420** to retrieve an associated AMC definition **430**, in action **840**. In one embodiment, the event monitor **410** may retrieve the AMC definition **430** based on a data source identifier. The data source identifier may include some unique identification for designating a particular table, database or other data structure, such as a file directory address, Internet address, URL, filename, or the like. Alternatively, an AMC definition **430** may be retrieved based on an identifier associated with the originating UI agent **110**, UI connection **120**, or UI session **111**. For example, an AMC definition **430** may be retrieved based on an identifier associated with a UI session **111**. The corresponding AMC definition **430** may list the identifier associated with the originating UI session **111** as a publisher to that AMC **415**.

Once the application server **221** retrieves the appropriate corresponding AMC definition **430** from the AMC registry **420**, it may broadcast the event notification to one or more subscribers listed in the AMC definition **430**. As described herein, a subscriber defined in the AMC definition **430** may include a UI agent **110**, a UI connection **120**, application **460**, or UI session **111**. In embodiments in which multiple UI connections **120** are defined as subscribers, the path from the UI session **111** that executed the triggering event through the AMC **415** associated with the AMC definition **420** to the UI connection **120** is referred to herein as a UI push channel **610**. Accordingly, any event notifications required by the AMC definitions **430** may be pushed to the corresponding subscribers through the UI push channel **610**, in action **850**.

FIG. **9** illustrates an example computer system and networks that may be used to implement embodiments of the present disclosure. Computer system **910** includes a bus **905** or other communication mechanism for communicating information, and a processor **901** coupled with bus **905** for processing information. Computer system **910** also includes a memory **902** coupled to bus **905** for storing information and instructions to be executed by processor **901**, including instructions for performing the techniques described above. This memory may also be used for storing temporary variables or other intermediate information during execution of instructions to be executed by processor **901**. Possible implementations of this memory may be, but are not limited to, random access memory (RAM), read only memory (ROM), or both. A storage device **903** is also provided for storing information and instructions. The information instructions can be in the form of computer readable code stored on the storage device, accessible and executable by processor to implement various techniques and methods of the present disclosure. Common forms of storage devices include non-transitory, non-volatile computer readable media, for example, a hard drive, a magnetic disk, an optical disk, a CD, a DVD, a flash memory, a USB memory card, or any other medium from which a computer can read.

Computer system **910** may be coupled via the same or different information bus, such as bus **905**, to a display **912**, touchscreen, or liquid crystal display (LCD), for displaying information. An input device **911** such as a keyboard, touchscreen, and/or mouse is coupled to a bus for communicating information and command selections from the user to processor **901**. The combination of these components allows the user to communicate with the system. In some embodiments, the display **912** and the input device **911** may be implemented in a single device, such as a touchscreen.

Computer system **910** also includes a network interface **904** coupled with bus **905**. Network interface **904** may provide two-way data communication between computer system **910** and the local network **920**. The network interface **904** may be a local area network (LAN) card to provide a data communication connection to a compatible LAN. The LAN card may include a wireless LAN (WLAN) card for communicating with a corresponding wireless network. In any such implementation, network interface **1004** sends and receives electrical, electromagnetic, or optical signals that carry digital data streams representing various types of information.

The above description illustrates various embodiments of the present invention along with examples of how aspects of the present invention may be implemented. The above examples and embodiments should not be deemed to be the only embodiments, and are presented to illustrate the flexibility and advantages of the present invention as defined by the following claims. Based on the above disclosure and the following claims, other arrangements, embodiments, implementations and equivalents will be evident to those skilled in the art and may be employed without departing from the spirit and scope of the invention as defined by the claims.

What is claimed is:

1. A method comprising:

instantiating, in an application server of a computer system,

a first user interface (UI) session in communication through a first UI connection with a corresponding first UI agent instantiated in a first client computing device and

a second UI session in communication through a second UI connection with a corresponding second UI agent instantiated in a second client computing device,

wherein the first UI session

handles transactions for information from a data source for the first UI agent to display on the first client computing device a first UI comprising the information from the data source,

wherein the second UI session

handles transactions for information from the data source for the second UI agent to display on the second client computing device a second UI comprising the information from the data source;

associating, in the computer system, the first and second UI connections with an application messaging channel (AMC), the AMC comprising an interface for communicating between the first UI session and the second UI session,

wherein associating the first UI connection with the AMC comprises

storing a UI connection identifier for the UI connection and an AMC identifier for the AMC in an AMC registry comprising a plurality of AMC definitions,

wherein each AMC definition in the plurality of AMC definitions comprises an AMC identifier associated with at least one UI connection identifier or a corresponding UI agent identifier;

receiving, in the computer system, on the AMC a notification of an event in the data source from the second UI session, wherein the event is caused by the second UI agent in the second client computing device; and

sending the notification of the event from the computer system to the first UI agent through the first UI connection.

2. The method of claim **1** further comprising:

receiving, by the first UI session, an update request from the first UI agent for updated information in response to the notification of the event;

processing, by the first UI session, the update request to generate the updated information from the data source; and

sending, by the first UI session, the updated information to first UI agent.

3. The method of claim **1**, wherein sending the notification of the event comprises referencing the AMC definition in the AMC registry associated with the AMC identifier of the AMC on which the notification of the event was received to determine one or more subscriber UI connections or one or more subscriber UI agents to which the notification of the event is to be published.

4. The method of claim **3**, wherein sending the notification of the event further comprises forwarding the notification to each of the subscriber UI connections or subscriber UI agents.

5. The method of claim **1**, wherein the AMC comprises an advanced business programming (ABAP) messaging channel.

6. The method of claim **1** further comprising:

instantiating a third UI session in communication through a third UI connection with a corresponding third UI agent instantiated in a third client computing device,

wherein the third UI session handles transactions for information from the data source for the third UI agent to display on the third client computing device a third UI comprising the information from the data source; and

sending the notification of the event from the computer system to the third UI agent through the third UI connection.

7. A non-transitory computer readable medium comprising instructions that when executed by a computer processor cause the computer processor to:

instantiate, in an application server,

a first user interface (UI) session in communication through a first UI connection with a corresponding first UI agent instantiated in a first client computing device and

a second UI session in communication through a second UI connection with a corresponding second UI agent instantiated in a second client computing device,

wherein the first UI session

handles transactions for information from a data source for the first UI agent to display on the first client computing device a first UI comprising the information from the data source,

wherein the second UI session handles

transactions for information from the data source for the second UI agent to display on the second client computing device a second UI comprising the information from the data source;

associate the first and second UI connections with an application messaging channel (AMC), the AMC comprising an interface for communicating between the first UI session and the second UI session,

wherein associating the first UI connection with the AMC comprises

storing a UI connection identifier for the UI connection and an AMC identifier for the AMC in an AMC registry comprising a plurality of AMC definitions,

wherein each AMC definition in the plurality of AMC definitions comprises an AMC identifier associated with at least one UI connection identifier or a corresponding UI agent identifier;

receive on the AMC a notification of an event in the data source from the second UI session,

wherein the event is caused by the second UI agent in the second client computing device; and

send the notification of the event to the first UI agent through the first UI connection.

8. The non-transitory computer readable medium of claim **7**, wherein the instructions further cause the computer processor to:

receive, by the first UI session, an update request from the first UI agent for updated information in response to the notification of the event;

processes, by the first UI session, the update request to generate the updated information from the data source; and

send, by the first UI session, the updated information to first UI agent.

9. The non-transitory computer readable medium of claim **7**, wherein sending the notification of the event comprises referencing the AMC definition in the AMC registry associated with the AMC identifier of the AMC on which the notification of the event was received to determine one or more subscriber UI connections or one or more subscriber UI agents to which the notification of the event is to be published.

10. The non-transitory computer readable medium of claim **9**, wherein sending the notification of the event further comprises forwarding the notification to each of the subscriber UI connections or subscriber UI agents.

11. The non-transitory computer readable medium of claim **7**, wherein the AMC comprises an advanced business programming (ABAP) messaging channel.

12. The non-transitory computer readable medium of claim **7**, wherein the instructions further cause the computer processor to:

instantiate a third UI session in communication through a third UI connection with a corresponding third UI agent instantiated in a third client computing device,

wherein the third UI session handles transactions for information from the data source for the third UI agent to display on the third client computing device a third UI comprising the information from the data source; and

send the notification of the event from the computer system to the third UI agent through the third UI connection.

13. A system comprising:

a computer processor; and

a non-transitory computer readable medium coupled to the computer processor and comprising instructions that when executed by the computer processor causes the computer processor to:

instantiate, in an application server,

a first user interface (UI) session in communication through a first UI connection with a corresponding first UI agent instantiated in a first client computing device and

a second UI session in communication through a second UI connection with a corresponding second UI agent instantiated in a second client computing device,

wherein the first UI session handles

transactions for information from a data source for the first UI agent to display on the first client computing device a first UI comprising the information from the data source,

wherein the second UI session handles

transactions for information from the data source for the second UI agent to display on the second client computing device a second UI comprising the information from the data source;

associate the first and second UI connections with an application messaging channel (AMC), the AMC comprising an interface for communicating between the first UI session and the second UI session,

wherein associating the first UI connection with the AMC comprises

storing a UI connection identifier for the UI connection and an AMC identifier for the AMC in an AMC registry comprising a plurality of AMC definitions,

wherein each AMC definition in the plurality of AMC definitions comprises an AMC identifier associated with at least one UI connection identifier or a corresponding UI agent identifier;

receive on the AMC a notification of an event in the data source from the second UI session,

wherein the event is caused by the second UI agent in the second client computing device; and

send the notification of the event to the first UI agent through the first UI connection.

14. The system of claim **13**, wherein the instructions further cause the computer processor to:

receive an update request from the first UI agent for updated information in response to the notification of the event;

process the update request to generate the updated information from the data source; and

send the updated information to first UI agent.

15. The system of claim **13**, wherein sending the notification of the event comprises referencing the AMC definition in the AMC registry associated with the AMC identifier of the AMC on which the notification of the event was received to determine one or more subscriber UI connections or one or more subscriber UI agents to which the notification of the event is to be published.

16. The system of claim **15**, wherein sending the notification of the event further comprises forwarding the notification to each of the subscriber UI connections or subscriber UI agents.

17. The system of claim **13**, wherein the AMC comprises an advanced business programming (ABAP) messaging channel.

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